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**ΤΜΗΜΑ ΔΗΜΟΤΙΚΗΣ ΕΚΠΑΙΔΕΥΣΗΣ ΦΛΩΡΙΝΑΣ**

**ECOLOGY**

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# Biosphere

## Biosphere

The largest scale of ecological organization is the biosphere: the total sum of ecosystems on the planet. [Environmental relationships](https://en.wikipedia.org/wiki/Ecological_relationship" \o "Ecological relationship) regulate the flux of energy, nutrients, and climate all the way up to the planetary scale. For example, the active history of the planetary atmosphere's CO2 and O2 composition has been affected by the biogenic flux of gases coming from respiration and photosynthesis, with levels fluctuating over time in relation to the ecology and evolution of plants and animals. Ecological theory has also been used to explain self-emergent regulatory phenomena at the earthly scale: for example, the [Gaia hypothesis](https://en.wikipedia.org/wiki/Gaia_hypothesis) is an example of [holism](https://en.wikipedia.org/wiki/Holism) applied in environmental theory. The Gaia hypothesis states that there is an emergent [feedback loop](https://en.wikipedia.org/wiki/Feedback_loop) generated by the metabolism of living organisms that maintains the core temperature of the Earth and atmospheric conditions within a narrow self-regulating range of tolerance.

The biosphere (from [Greek](https://en.wikipedia.org/wiki/Ancient_Greek) βίος bíos "life" and σφαῖρα sphaira "sphere") also known as the ecosphere (from Greek οἶκος oîkos "environment" and σφαῖρα), is the worldwide sum of all [ecosystems](https://en.wikipedia.org/wiki/Ecosystem). It can also be termed the zone of [life](https://en.wikipedia.org/wiki/Life) on [Earth](https://en.wikipedia.org/wiki/Earth), a closed system (apart from [solar](https://en.wikipedia.org/wiki/Sun) and [cosmic radiation](https://en.wikipedia.org/wiki/Cosmic_radiation) and [heat](https://en.wikipedia.org/wiki/Heat) from the interior of the Earth), and largely self-regulating. By the most general [biophysiological](https://en.wikipedia.org/wiki/Geophysiology) definition, the biosphere is the global ecological system integrating all living beings and their relationships, including their interaction with the elements of the lithosphere, geosphere, hydrosphere, and atmosphere. The biosphere is postulated to have evolved, beginning with a process of biopoiesis (life created naturally from non-living matter, such as simple organic compounds) or [biogenesis](https://en.wikipedia.org/wiki/Biogenesis) (life created from living matter), at least some 3.5 billion years ago.

In a general sense, biospheres are any closed, self-regulating systems containing ecosystems. This includes artificial biospheres such as [Biosphere 2](https://en.wikipedia.org/wiki/Biosphere_2) and [BIOS-3](https://en.wikipedia.org/wiki/BIOS-3), and potentially ones on other planets or moons.

The [earliest evidence](https://en.wikipedia.org/wiki/Earliest_known_life_forms) for [life on Earth](https://en.wikipedia.org/wiki/Life) includes [biogenic](https://en.wikipedia.org/wiki/Biogenic_substance) [graphite](https://en.wikipedia.org/wiki/Graphite) found in 3.7 billion-year-old [metasedimentary rocks](https://en.wikipedia.org/wiki/Metasediment) from [Western Greenland](https://en.wikipedia.org/wiki/Western_Greenland) and [microbial mat](https://en.wikipedia.org/wiki/Microbial_mat) [fossils](https://en.wikipedia.org/wiki/Fossils) found in 3.48 billion-year-old sandstone from Western Australia. More recently, in 2015, "remains of biotic life" were found in 4.1 billion-year-old rocks in Western Australia. In 2017, putative fossilized microorganisms (or microfossils) were announced to have been discovered in hydrothermal vent precipitates in the Nuvvuagittuq Belt of Quebec, Canada that were as old as 4.28 billion years, the oldest record of life on earth, suggesting "an almost instantaneous emergence of life" after ocean formation 4.4 billion years ago, and not long after the formation of the Earth 4.54 billion years ago. According to biologist [Stephen Blair Hedges](https://en.wikipedia.org/wiki/Stephen_Blair_Hedges), "If life arose relatively quickly on Earth ... then it could be common in the [universe](https://en.wikipedia.org/wiki/Universe)."

Geochemists define the biosphere as being the total sum of living organisms (the "[biomass](https://en.wikipedia.org/wiki/Biomass_(ecology))" or "[biota](https://en.wikipedia.org/wiki/Biota_(ecology))" as referred to by biologists and ecologists). In this sense, the biosphere is but one of four separate components of the geochemical model, the other three being [geosphere](https://en.wikipedia.org/wiki/Geosphere), [hydrosphere](https://en.wikipedia.org/wiki/Hydrosphere), and [atmosphere](https://en.wikipedia.org/wiki/Earth%27s_atmosphere). When these four component spheres are combined into one system, it is known as the [Ecosphere](https://en.wikipedia.org/wiki/Ecosphere_(planetary)). This term was coined during the 1960s and encompasses both biological and physical components of the plan.

# Ecosystem

## Ecosystem

An ecosystem is a [community](https://en.wikipedia.org/wiki/Community_(ecology)) made up of living organisms and [nonliving components](https://en.wikipedia.org/wiki/Abiotic_component) such as air, water and mineral soil, all interacting as a system. (However, ecosystems can be defined in many ways.) the [biotic](https://en.wikipedia.org/wiki/Biotic_component) and [abiotic components](https://en.wikipedia.org/wiki/Abiotic_component) interact through [nutrient cycles](https://en.wikipedia.org/wiki/Nutrient_cycles) and energy flows. Ecosystems are the network of interactions among organisms, and between organisms and their environment. Ecosystems can be of any size but one ecosystem has a specific, limited space. On a larger scale, some scientists view the entire planet as one ecosystem).

## Abiotic Components

Energy, water, [nitrogen](https://en.wikipedia.org/wiki/Nitrogen" \o "Nitrogen) and soil minerals are other essential abiotic components of an ecosystem. The energy that flows through ecosystems comes primarily from the [sun](https://en.wikipedia.org/wiki/Sun" \o "Sun), through [photosynthesis.](https://en.wikipedia.org/wiki/Photosynthesis" \o "Photosynthesis) Photosynthesis also captures [carbon dioxide](https://en.wikipedia.org/wiki/Carbon_dioxide" \o "Carbon dioxide) from the atmosphere. [Animals](https://en.wikipedia.org/wiki/Animal" \o "Animal) also play an important role in the movement of matter and energy through ecoystems. They influence the amount plant and [microbial](https://en.wikipedia.org/wiki/Microbe" \o "Microbe) [biomass](https://en.wikipedia.org/wiki/Biomass_(ecology)" \o "Biomass (ecology)) that lives in the system. As organic matter dies, [decomposers](https://en.wikipedia.org/wiki/Decomposer" \o "Decomposer) release carbon back to the atmosphere. This process also facilitates [nutrient cycling](https://en.wikipedia.org/wiki/Nutrient_cycling" \o "Nutrient cycling) by converting nutrients stored in dead biomass back to a form that can be used again by plants and other microbes.

## External and Internal Factors

Ecosystems are controlled both by external and internal factors. External factors such as [climate](https://en.wikipedia.org/wiki/Climate" \o "Climate), the [parent material](https://en.wikipedia.org/wiki/Parent_material" \o "Parent material) that forms the soil, [topography](https://en.wikipedia.org/wiki/Topography" \o "Topography) and time have a big impact on ecosystems, but they are not themselves influenced by the ecosystem. Ecosystems are dynamic: they are subject to periodic disturbances and are in the process of recovering from past [disturbances](https://en.wikipedia.org/wiki/Disturbance_(ecology)" \o "Disturbance (ecology)) that were external to the ecosystem. Internal factors are different. They not only control ecosystem processes but are also controlled by them. Internal factors are subject to [feedback loops](https://en.wikipedia.org/wiki/Feedback).

[Humans](https://en.wikipedia.org/wiki/Human) operate within ecosystems and the cumulative effects of human activities can influence even external factors. [Climate change](https://en.wikipedia.org/wiki/Climate_change) is an example of that cumulative impact. Ecosystems provide benefits--called [Ecosystem services](https://en.wikipedia.org/wiki/Ecosystem_services)--which people depend on and can disrupt to their own detriment. Best practices of [Ecosystem management](https://en.wikipedia.org/wiki/Ecosystem_management) suggests that it's better to manage at the ecosystem level, rather than trying to managing individual species.

# Biomass (ecology)

## Biomass

Biomass is the mass of living biological organisms in a given area or [ecosystem](https://en.wikipedia.org/wiki/Ecosystem" \o "Ecosystem) at a given time. Biomass can refer to species biomass, which is the mass of one or more species, or to community biomass, which is the mass of all species in the community. It can include [microorganisms](https://en.wikipedia.org/wiki/Microorganisms), plants or animals. The mass can be expressed as the average mass per unit area, or as the total mass in the community.

How biomass is measured depends on why it is being measured. Sometimes, the biomass is regarded as the natural mass of organisms in situ, just as they are. For example, in a salmon [fishery](https://en.wikipedia.org/wiki/Fishery), the salmon biomass might be regarded as the total wet weight the salmon would have if they were taken out of the water. In other contexts, biomass can be measured in terms of the dried organic mass, so perhaps only 30% of the actual weight might count, the rest being water. For other purposes, only biological tissues count, and teeth, bones and shells are excluded. In some applications, biomass is measured as the mass of [organically bound carbon](https://en.wikipedia.org/wiki/Organic_carbon) (C) that is present.

Apart from bacteria, the total live biomass on Earth is about 560 billion tonnes C, and the total annual primary production of biomass is just over 100 billion tonnes C/yr. The total live biomass of bacteria may be as much as that of plants and animals or may be much less. The total amount of DNA base pairs on Earth, as a possible approximation of global biodiversity, is estimated at 5.0 x 1037, and weighs 50 billion tonnes. In comparison, the total mass of the [biosphere](https://en.wikipedia.org/wiki/Biosphere" \o "Biosphere) has been estimated to be as much as 4 x 1012 tonnes of [carbon](https://en.wikipedia.org/wiki/Carbon).

## Terrestrial biomass

Terrestrial biomass generally decreases markedly at each higher [trophic level](https://en.wikipedia.org/wiki/Trophic_level) (plants, herbivores, carnivores). Examples of terrestrial [producers](https://en.wikipedia.org/wiki/Autotroph) are grasses, trees and shrubs. These have a much higher biomass than the animals that [consume them](https://en.wikipedia.org/wiki/Heterotroph), such as deer, zebras and insects. The level with the least biomass are the highest [predators](https://en.wikipedia.org/wiki/Predator) in the [food chain](https://en.wikipedia.org/wiki/Food_chain), such as foxes and eagles.

In a temperate grassland, grasses and other plants are the primary producers at the bottom of the pyramid. Then come the primary consumers, such as grasshoppers, voles and bison, followed by the secondary consumers, shrews, hawks and small cats. Finally the tertiary consumers, large cats and wolves. The biomass pyramid decreases markedly at each higher level.

Complex Table (less accessible)

**Class Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LESSON** | **TOPIC** | **ASSIGNMENT** | **Points** | **DUE** |
| 1 | What is Distance Learning? | Wiki #1 | 10 | March 10 |
|  | Presentation | 20 |  |
| 2 | History & Theories | Brief Paper | 20 | March 24 |
| Spring Break | | | | |
| 3 | Distance Learners | Discussion #1 | 10 | April 7 |
| Group Project | 50 | April 14 |
| 4 | Media Selection | Blog #1 | 10 | April 21 |

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# Natural environment

The natural environment encompasses all [living](https://en.wikipedia.org/wiki/Life) and non-living things occurring [naturally](https://en.wikipedia.org/wiki/Nature), meaning in this case not [artificial](https://en.wikipedia.org/wiki/Artificiality). The term is most often applied to the [Earth](https://en.wikipedia.org/wiki/Earth) or some parts of Earth. This environment encompasses the interaction of all living [species](https://en.wikipedia.org/wiki/Species), [climate](https://en.wikipedia.org/wiki/Climate), weather, and natural resources that affect human survival and economic activity. The concept of the natural environment can be distinguished as components:

## Complete [ecological](https://en.wikipedia.org/wiki/Ecological)

Complete [ecological](https://en.wikipedia.org/wiki/Ecological) units that function as natural systems without massive civilized human intervention, including all vegetation, [microorganisms](https://en.wikipedia.org/wiki/Microorganism), [soil](https://en.wikipedia.org/wiki/Soil), [rocks](https://en.wikipedia.org/wiki/Rock_(geology)), [atmosphere](https://en.wikipedia.org/wiki/Atmosphere_of_Earth), and [natural phenomena](https://en.wikipedia.org/wiki/Natural_phenomenon) that occur within their boundaries and their nature.

## Universal [natural resources](https://en.wikipedia.org/wiki/Natural_resource) and [physical phenomena](https://en.wikipedia.org/wiki/Physical_phenomena)

Universal [natural resources](https://en.wikipedia.org/wiki/Natural_resource) and [physical phenomena](https://en.wikipedia.org/wiki/Physical_phenomena) that lack clear-cut boundaries, such as air, water, and climate, as well as [energy](https://en.wikipedia.org/wiki/Energy), [radiation](https://en.wikipedia.org/wiki/Radiation), [electric charge](https://en.wikipedia.org/wiki/Electric_charge), and [magnetism](https://en.wikipedia.org/wiki/Magnetism), not originating from civilized human actions

In contrast to the natural environment is the [built environment](https://en.wikipedia.org/wiki/Built_environment). In such areas where man has fundamentally transformed landscapes such as urban settings and agricultural [land conversion](https://en.wikipedia.org/wiki/Land_development), the natural environment is greatly modified into a simplified human environment. Even acts which seem less extreme, such as building a mud [hut](https://en.wikipedia.org/wiki/Hut) or a [photovoltaic system](https://en.wikipedia.org/wiki/Photovoltaic_system) in the [desert](https://en.wikipedia.org/wiki/Desert), modify the natural environment into an artificial one. Though many animals build things to provide a better environment for themselves, they are not human, hence [beaver dams](https://en.wikipedia.org/wiki/Beaver_dam) and the works of [Mound-building termites](https://en.wikipedia.org/wiki/Mound-building_termites) are thought of as natural.

People seldom find absolutely natural environments on Earth, and naturalness usually varies in a continuum, from 100% natural in one extreme to 0% natural in the other. More precisely, we can consider the different aspects or components of an environment, and see that their degree of naturalness is not uniform. If, for instance, in an agricultural field, the [mineralogic composition](https://en.wikipedia.org/wiki/Mineralogy) and the [structure](https://en.wikipedia.org/wiki/Soil_structure) of its soil are similar to those of an undisturbed forest soil, but the structure is quite different.

Natural environment is often used as a synonym for [habitat](https://en.wikipedia.org/wiki/Habitat). For instance, when we say that the natural environment of giraffes is the [savanna](https://en.wikipedia.org/wiki/Savanna).

# Biodiversity

## Biodiversity

Biodiversity, a [portmanteau](https://en.wikipedia.org/wiki/Portmanteau" \o "Portmanteau) of "bio" (life) and "diversity", generally refers to the [variety](https://en.wiktionary.org/wiki/variety" \o "wikt:variety) and [variability](https://en.wikipedia.org/wiki/Genetic_variability" \o "Genetic variability) of [life on Earth](https://en.wikipedia.org/wiki/Life" \o "Life). According to the [United Nations Environment Programme](https://en.wikipedia.org/wiki/United_Nations_Environment_Programme) (UNEP), biodiversity typically measures variation at the [genetic](https://en.wikipedia.org/wiki/Genetics" \o "Genetics), the [species](https://en.wikipedia.org/wiki/Species" \o "Species), and the [ecosystem](https://en.wikipedia.org/wiki/Ecosystem) level. Terrestrial biodiversity tends to be greater near the [equator](https://en.wikipedia.org/wiki/Equator), which seems to be the result of the warm [climate](https://en.wikipedia.org/wiki/Climate" \o "Climate) and high [primary productivity](https://en.wikipedia.org/wiki/Primary_productivity). Biodiversity is not distributed evenly on [Earth](https://en.wikipedia.org/wiki/Earth" \o "Earth), and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. [Marine biodiversity](https://en.wikipedia.org/wiki/Marine_biology" \o "Marine biology) tends to be highest along coasts in the Western [Pacific](https://en.wikipedia.org/wiki/Pacific_Ocean" \o "Pacific Ocean), where [sea surface temperature](https://en.wikipedia.org/wiki/Sea_surface_temperature" \o "Sea surface temperature) is highest, and in the mid-latitudinal band in all oceans. There are [latitudinal gradients in species diversity](https://en.wikipedia.org/wiki/Latitudinal_gradients_in_species_diversity" \o "Latitudinal gradients in species diversity). Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

## Rapid [environmental changes](https://en.wikipedia.org/wiki/Environmental_change)

Rapid environmental changes typically cause [mass extinctions](https://en.wikipedia.org/wiki/Mass_extinction). More than 99.9 percent of all species that ever lived on Earth, amounting to over five billion species, are estimated to be [extinct](https://en.wikipedia.org/wiki/Extinction). Estimates on the number of Earth's current [species](https://en.wikipedia.org/wiki/Species" \o "Species) range from 10 million to 14 million, of which about 1.2 million have been documented and over 86 percent have not yet been described. More recently, in May 2016, scientists reported that 1 trillion species are estimated to be on Earth currently with only one-thousandth of one percent described. The total amount of related [DNA](https://en.wikipedia.org/wiki/DNA" \o "DNA) [base pairs](https://en.wikipedia.org/wiki/Base_pair" \o "Base pair) on Earth is estimated at 5.0 x 1037 and weighs 50 billion [tonnes](https://en.wikipedia.org/wiki/Tonne). In comparison, the total [mass](https://en.wikipedia.org/wiki/Biomass_(ecology)" \o "Biomass (ecology)) of the [biosphere](https://en.wikipedia.org/wiki/Biosphere" \o "Biosphere) has been estimated to be as much as 4 [TtC](https://en.wikipedia.org/wiki/Tonnes#Derived_units) (trillion tons of [carbon](https://en.wikipedia.org/wiki/Carbon)). In July 2016, scientists reported identifying a set of 355 [genes](https://en.wikipedia.org/wiki/Gene" \o "Gene) from the [Last Universal Common Ancestor](https://en.wikipedia.org/wiki/Last_Universal_Common_Ancestor" \o "Last Universal Common Ancestor) (LUCA) of all [organisms](https://en.wikipedia.org/wiki/Organism) living on Earth.

The age of the Earth is about 4.54 billion years. The earliest undisputed evidence of life on Earth dates at least from 3.5 billion years ago, during the Eoarchean Era after a geological crust started to solidify following the earlier molten Hadean Eon. There are microbial mat fossils found in 3.48 billion-year-old sandstone discovered in Western Australia. Other early physical evidence of a biogenic substance is graphite in 3.7 billion-year-old meta-sedimentary rocks discovered in Western Greenland. More recently, in 2015, "remains of biotic life" were found in 4.1 billion-year-old rocks in Western Australia. According to one of the researchers, "If life arose relatively quickly on Earth .. then it could be common in the universe."

Since [life began on Earth](https://en.wikipedia.org/wiki/Abiogenesis" \o "Abiogenesis), five major [mass extinctions](https://en.wikipedia.org/wiki/Mass_extinctions" \o "Mass extinctions) and several minor events have led to large and sudden drops in biodiversity. The [Phanerozoic](https://en.wikipedia.org/wiki/Phanerozoic" \o "Phanerozoic) eon (the last 540 million years) marked a rapid growth in biodiversity via the [Cambrian explosion](https://en.wikipedia.org/wiki/Cambrian_explosion" \o "Cambrian explosion)—a period during which the majority of [multicellular](https://en.wikipedia.org/wiki/Multicellular_organism) [phyla](https://en.wikipedia.org/wiki/Phylum) first appeared. The next 400 million years included repeated, massive [biodiversity losses](https://en.wikipedia.org/wiki/Biodiversity_loss) classified as [mass extinction](https://en.wikipedia.org/wiki/Mass_extinction) events. In the [Carboniferous](https://en.wikipedia.org/wiki/Carboniferous), [rainforest collapse](https://en.wikipedia.org/wiki/Rainforest_collapse) led to a great loss of [plant](https://en.wikipedia.org/wiki/Plant) and [animal](https://en.wikipedia.org/wiki/Animal) life. The [Permian–Triassic extinction event](https://en.wikipedia.org/wiki/Permian%E2%80%93Triassic_extinction_event), 251 million years ago, was the worst; vertebrate recovery took 30 million years. The most recent, the [Cretaceous–Paleogene extinction event](https://en.wikipedia.org/wiki/Cretaceous%E2%80%93Paleogene_extinction_event), occurred 65 million years ago and has often attracted more attention than others because it resulted in the extinction of the [dinosaurs](https://en.wikipedia.org/wiki/Dinosaur).

The period since the emergence of [humans](https://en.wikipedia.org/wiki/Humans) has displayed an ongoing biodiversity reduction and an accompanying loss of [genetic diversity](https://en.wikipedia.org/wiki/Genetic_diversity). Named the [Holocene extinction](https://en.wikipedia.org/wiki/Holocene_extinction), the reduction is caused primarily by [human impacts](https://en.wikipedia.org/wiki/Human_impact_on_the_environment), particularly [habitat](https://en.wikipedia.org/wiki/Habitat_(ecology)) destruction. Conversely, biodiversity positively impacts [human health](https://en.wikipedia.org/wiki/Health) in a number of ways, although a few negative effects are studied.

# Η οικογένειά μου